MANCHESTER AND SALFORD

SANITARY ASSOCIATION.

REPORT

ON THE

Quality of Illuminating Oils,

SOLD IN

MANCHESTER AND THE NEIGHBOURHOOD.

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REPORT

ON THE

QUALITY OF ILLUMINATING OILS,

SOLD IN

MANCHESTER AND THE NEIGHBOURHOOD.

In compliance with a request of the General Committee of the Manchester and Salford Sanitary Association, I have examined a number of samples of oils sold in this town and neighbourhood. In all I have examined thirty-two samples, twenty-five of which were bought at as many different retail shops. Two samples of Paraffin oil I obtained direct from the Paraffin Light Company's premises; and five samples of oil, obtained from London, Liverpool, and Bradford, were forwarded to me by the Paraffin Light Company, and included in my examination. The full names and addresses of the parties supplying the oils are given in the Appendix to this Report.

Out of the twenty-five samples, purchased in Manchester, sixteen were clearly identical with the genuine samples of Paraffin oil supplied to me by the Manchester agency, the other nine samples consisted of other kinds of oil differing from the Paraffin oil and from one another. Some of them were supplied in answer to a request for Paraffin oil; three or four purported to be American rock oils, and were sold under the names of Petrolene, Kerosene, and Photogene, The whole nine were doubtless various qualities of American rock oils; and, adding to these the five samples sent by the Paraffin Light Company, I had fourteen samples from the new and extraordinary oil wells in Pennsylvania and Canada; the remaining eighteen samples being the home manufactured oil sold as "Young's Patent Paraffin Oil."

I obtained three of the lamps employed for burning these oils; they were low-priced lamps, such as are used in the poorer sort of houses, but do not appear to differ in any essential point of construction from the more expensive lamps. These lamps are constructed purposely for burning the Paraffin oil; they are not suitable for burning the older kinds of lamp oil, nor are they safe with very volatile fluids, as naptha and camphine.

In deciding whether any of the samples under investigation were dangerous or not, I have considered them entirely in reference to the lamp in which they are used; some of the oils called dangerous might be *safely* used in another kind of lamp, and the safest of them would be dangerous if used in a Moderator or Carcel lamp.

It results, from my experiments, that the chances of accident from the use of these oils may be referred almost exclusively to their greater or less proneness to form an explosive mixture with the air contained in a partly filled bottle or lamp reservoir. I believe it will be found that nearly all the accidents arising from the use of the new illuminating oils have been primarily caused by the ignition of the explosive mixture of combustible vapour and air, either in the bottle in which the stock of oil is kept, or in the reservoir of the lamp; very few accidents happen while the lamp is burning, they nearly all occur while pouring out the oil, or in lighting or trimming the lamp. The explosion may break the vessel and scatter the oil about, and if it be very inflammable in an ignited state.

My examination was then chiefly directed to ascertain whether any of the oils would form an explosive mixture with air, at the medium temperature of 60° Fahrenheit; this temperature may represent the average temperature of domestic rooms where the bottles of oil are kept. To ascertain this point about a quarter of an ounce of the oil was put into a six-ounce stoppered bottle, the stopper inserted, and the bottle shaken and moved about so as to facilitate the escape of vapour from the oil; in three or four minutes the stopper was taken out and a lighted match held to the mouth of the bottle; if there was a rush of pale blue light through the bottle the oil was said to give off an explosive vapour at the ordinary temperature, and to be highly dangerous; only two samples out of the thirty-two exploded at a temperature of 60°, numbers one and three, from London and Liverpool respectively. But this temperature can only be considered as the lowest limit of possible danger, the actual limit of danger is the highest temperature to which, under all ordinary circumstances, the oil is likely to be exposed, either in storing or while burning in the lamp. I concluded from my experiments that a temperature of from 85° to 90° might be calculated upon as often existing in the cistern of a lamp, this high temperature being produced by a long-continued burning of the lamp in a warm room and on a table near the fire. Any oil, therefore, giving off a combustible vapour and forming an explosive mixture with air at this temperature must be looked upon as unsafe for ordinary use. I tested the remaining thirty samples and found three which gave an explosive mixture at 85° Fahrenheit. These are numbers four, five, and sixteen, bought respectively in Liverpool, Bradford, and Hulme, Manchester. There are, therefore, five samples really dangerous, and which would require the constant exercise of care and skill to prevent serious accidents.

In order to classify the remaining oils I submitted the whole of them to a temperature of 100° Fahrenheit, and found four of them to yield an explosive mixture at this temperature, viz., numbers two, nine, eleven, and twelve; three of these were purchased in Manchester. These oils would be highly dangerous if used in any situation where the temperature was as high as 100°; and, though I consider them as unsafe oils, I cannot call them highly dangerous, because the temperature of 100° is hardly ever reached in this climate, and never in the night when lights are required.

As a next step I exposed the whole of the remaining oils to a temperature of 120° Fahrenheit, testing the explosibility of the vapour; three samples proved explosive at this temperature, viz., numbers twenty-one, twenty-five, and twenty-eight, purchased in Salford, Hulme, and Manchester. This temperature seems too high to be reached under any ordinary circumstances in a lamp, and I should consider them as ordinarily safe oils. I submitted the remaining twenty samples to a temperature of 150° Fahrenheit, and found that every one yielded an explosive mixture at that temperature, but this I consider beyond the limits of possible danger, and I consider these twenty as very safe oils.

Of the twenty samples which could not be made to explode at 120° two were American rock oils, and eighteen were Young's Paraffin oils; the whole of Young's Paraffin oils tested were safe oils. Out of the twelve samples which exploded at or below 120° all were American oils; seven of which were purchased in this neighbourhood.

To recapitulate: Out of thirty-two samples I consider I found twenty quite safe, three less safe but not really dangerous, and nine too dangerous to be used for domestic purposes; four only of the dangerous oils were purchased in Manchester. Out of fourteen samples of American oil two were as safe as Paraffin oil, three less safe but not dangerous, and nine are to be looked upon as dangerous.

In addition to the explosive method of testing, I have tried the liability of the various samples to burst into flame, upon contact with a lighted body. I find this inflammability is in close if not in exact relation with the explosibility, but from various reasons I do not consider it as good a method of testing, I find none of the samples of Young's Paraffin oil to take fire at 130°; out of fourteen samples of American oil eleven inflame at this temperature, and three do not. When the oils are scattered upon linen or woollen rags, at the natural temperature of the air, they burst into violent flame upon the most momentary contact with a lighted match or candle; in this, the most dangerous property of these oils, there is no considerable difference between the best and the worst samples of the American and Paraffin oils.

The specific gravity of the samples does not give any idea of their liability to explosion, but it forms a tolerably reliable means of distinguishing between the British Paraffin oil and the American substitutions. Eighteen samples of Young's Paraffin oil had an average specific gravity of 833; the American oils are generally below 816, but two samples, and those bad ones, were as high as 830; while a sample of coal naptha, incomparably more combustible and dangerous than any of them, had a density of 865. The boiling point is no better guide, for though volatility is generally in close relation to the boiling point, the vapours of many combustible bodies have so high a diffusive power as to compensate for very high boiling points. For example; a sample of coal naptha boiling at 260° Fahrenheit gives an explosive mixture almost instantly, even at the freezing point. The true Paraffin oils commence ebullition at about 300°, rising as high as 380° in glass vessels; the worst of the American oils did not commence to boil until at 260°.

With regard to illuminating materials in general, the Paraffin and so-called Paraffin oils which I have examined hold a place intermediate between the old lamp oils, which cannot explode in any kind of lamp and the very volatile and inflammable fluids, such as naptha, camphine, and spirits of wine, which are liable to explosion at all times, and are employed with this knowledge. The common coal naptha is infinitely more dangerous, more explosive, and more inflammable than any of the American oils I have examined, yet it is largely consumed as an illuminating material, and with few accidents, because its dangerous properties are known and guarded against. The real danger to society is in selling one species of oil for another; if Paraffin were sold for sperm oil it would be as dangerous as if naptha were sold for Paraffin. Genuine Paraffin oil is perfectly safe in a Paraffin lamp, a majority of the American oils are not safe in this lamp.

While guarding ourselves and the public against a real danger, it would be unwise to join in an undiscerning cry against the new American oils, which promise to become a valuable article of commerce and which are, in reality, far less dangerous to handle than many a combustible substance largely dealt in and necessary for the wants of society.

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